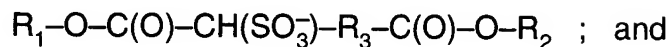
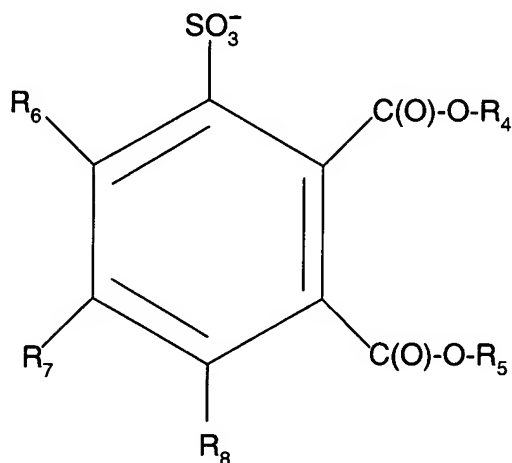


**What Is Claimed Is:**

1. An ionic liquid composition comprising:
  - (a) a cation having more than 4 carbon atoms; and
  - (b) an anion selected from the group consisting of



**I**



**II**

wherein  $R_1$ ,  $R_2$ ,  $R_4$  and  $R_5$  are independently selected from the group consisting of substituted or unsubstituted alkyl or alkenyl groups;

wherein  $R_3$  is a substituted or unsubstituted alkylene group, heteroarylene group, arylene group, or cycloalkylene group ;

wherein  $R_6$ ,  $R_7$ , and  $R_8$  are independently selected from H, alkyl,  $NO_2$ , halo, cyano, silyl, and OH;

or  $R_1$  and  $R_2$  may be taken together to form a ring;

or  $R_4$  and  $R_5$  may be taken together to form a ring;

or  $R_6$  and  $R_7$  or  $R_7$  and  $R_8$  may be taken together to form a ring.

2. The composition of Claim 1 wherein the anion has the chemical structure I.
3. The composition of Claim 2 wherein  $R_1$  and  $R_2$  are independently selected from alkyl groups having about five or more carbon atoms.
4. The composition of Claim 2 wherein  $R_1$  and  $R_2$  are independently selected from alkyl groups having from about six to about eighteen carbon atoms.

- 1 5. The composition of Claim 2 wherein  $R_3$  is  $-(CH_2)_n-$  wherein  $n$  is an integer of from about  
2 one to about 10.
- 3 6. The composition of Claim 5 wherein  $R_1$  and  $R_2$  are independently selected from alkyl  
4 groups having from about six to about eighteen carbon atoms.
- 5 7. The composition of Claim 6 wherein  $n$  is one and  $R_1$  and  $R_2$  are  
6  $-CH_2-CH(CH_2CH_3)(CH_5CH_2-CH_3)$ .
- 7 8. The composition of Claim 1 wherein the anion has the chemical structure II.
- 8 9. The composition of Claim 8 wherein  $R_6$ ,  $R_7$ , and  $R_8$  are H.
- 9 10. The composition of Claim 8 wherein  $R_4$  and  $R_5$  are independently selected from alkyl  
10 groups having about five or more carbon atoms.
- 11 11. The composition of Claim 8 wherein  $R_4$  and  $R_5$  are independently selected from alkyl  
12 groups having from about six to about eighteen carbon atoms.
- 13 12. The composition of Claim 9 wherein  $R_4$  and  $R_5$  are independently selected from alkyl  
14 groups having about five or more carbon atoms.
- 15 13. The composition of Claim 9 wherein  $R_4$  and  $R_5$  are  $-CH_2-CH(CH_2CH_3)(CH_2-CH_2-CH_3)$ .
- 16 14. The composition of Claim 2 further comprising a catalyst.
- 17 15. The composition of Claim 7 further comprising a catalyst.
- 18 16. The composition of Claim 2 further comprising a hydrocarbon.
- 19 17. The composition of Claim 7 further comprising a hydrocarbon.
- 20 18. The composition of Claim 8 further comprising a catalyst.
- 21 19. The composition of Claim 9 further comprising a catalyst.
- 22 20. The composition of Claim 8 further comprising a hydrocarbon.
- 23 21. The composition of Claim 9 further comprising a hydrocarbon.
- 24 22. The composition of Claim 1 wherein the cation is a quaternary ammonium or quaternary  
25 phosphonium.
- 26 23. The composition of Claim 22 wherein the quaternary ammonium cation is independently  
27 selected from the group consisting of substituted or unsubstituted pyridinium, pyridazinium,  
28 pyrimidinium, pyrazinium, imidazolium, pyrazolium, thiazolium, oxazolium, triazolium,  
29 imidazolinium, methylpyrrolidinium, isothiazolium, isoxazolium, oxazolium, pyrrolium, and  
30 thiophenium.

24. The composition of Claim 1 wherein the cation is an ammonium cation substituted by one or more groups selected from the group consisting of alkyl and aryl groups.

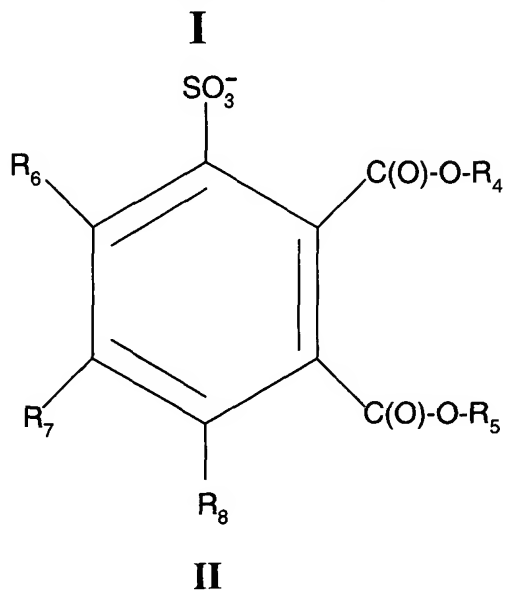
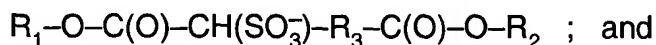
25. The composition of Claim 22 wherein the quaternary ammonium cation is BMIM.

26. The composition of Claim 1 wherein the cation is tetrabutyl ammonium, tributylmethyl ammonium, tetrabutyl phosphonium, tetraethyl ammonium, N, N – dialkyl pyrrolidinium, trimethyl 2-hydroxyethyl ammonium, N, N' – dialkyl imidazolium, N-alkylpyridinium, or a mixture thereof.

27. An ionic liquid composition comprising at least about 55 weight percent of an ionic liquid comprising:

(a) a cation; and

(b) an anion selected from the group consisting of



wherein  $R_1$ ,  $R_2$ ,  $R_4$  and  $R_5$  are independently selected from the group consisting of substituted or unsubstituted alkyl or alkenyl groups;

wherein  $R_3$  is a substituted or unsubstituted alkylene group, heteroarylene group, arylene group, or cycloalkylene group ;

wherein  $R_6$ ,  $R_7$ , and  $R_8$  are independently selected from H, alkyl, alkoxy, alkylthio,  $SO_3H$ ,  $NO_2$ , halo, cyano, silyl, and OH;

or  $R_1$  and  $R_2$  may be taken together to form a ring;

1 or R<sub>4</sub> and R<sub>5</sub> may be taken together to form a ring;

2 or R<sub>6</sub> and R<sub>7</sub> or R<sub>7</sub> and R<sub>8</sub> may be taken together to form a ring.

3 28. The composition of Claim 27 wherein the ionic liquid is hydrophobic.

4 29. The composition of Claim 28 wherein the cation is a quaternary ammonium or quaternary  
5 phosphonium.

6 30. The composition of Claim 29 wherein the quaternary ammonium cation is independently  
7 selected from the group consisting of substituted or unsubstituted pyridinium, pyridazinium,  
8 pyrimidinium, pyrazinium, imidazolium, pyrazolium, thiazolium, oxazolium, triazolium,  
9 imidazolinium, methylpyrrolidinium, isothiazolium, isoxazolium, oxazolium, pyrrolium, and  
10 thiophenium.

11 31. The composition of Claim 30 wherein the cation is an ammonium cation substituted by  
12 one or more groups selected from the group consisting of alkyl and aryl groups.

13 32. The composition of Claim 30 wherein the quaternary ammonium cation is BMIM.

14 33. The composition of Claim wherein the cation is tetrabutyl ammonium, tributylmethyl  
15 ammonium, tetrabutyl phosphonium, tetraethyl ammonium, N, N – dialkyl pyrrolidinium,  
16 trimethyl 2-hydroxyethyl ammonium, N, N' – dialkyl imidazolium, N-alkylpyridinium, or a  
17 mixture thereof.

18 34. The composition of Claim 27 wherein the anion is Docusate.

19 35. The composition of Claim 27 wherein the anion has the chemical structure I and is  
20 hydrophobic.

21 36. The composition of Claim 27 wherein the anion has the chemical structure II and is  
22 hydrophobic.

23 37. The composition of Claim 27 wherein the anion has the chemical structure I and is  
24 hydrophilic.

25 38. The composition of Claim 27 wherein the anion has the chemical structure II and is  
26 hydrophilic.

27 39. The composition of Claim 1 wherein the ionic liquid is hydrophobic.

28 40. The composition of Claim 1 wherein the ionic liquid is hydrophilic.

29 41. The composition of Claim 1 wherein the anion is selected from the group consisting of  
30 the anions of (i) di-n-cyclohexyl ester of sulfosuccinic acid; (ii) di-n-octyl ester of sulfosuccinic  
31 acid; (iii) di-n-butyl ester of sulfosuccinic acid; (iv) di-isobutyl ester of sulfosuccinic acid; (v) di-

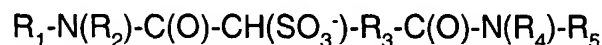
neopentyl ester of sulfosuccinic acid; (vi) di-n-heptyl ester of sulfosuccinic acid; and (vii) di-n-heptyl ester of sulfosuccinic acid.

42. The composition of Claim 41 wherein the cation is tetrabutyl ammonium.

43. An ionic liquid composition, comprising:

(a) an onium cation; and

(b) an anion having the following structure:



### III

wherein  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  are independently selected from the group consisting of a hydrogen atom and a carbon-containing group;

and wherein the ionic liquid has a melting point that is less than about 100°C.

44. The composition of Claim 43, wherein  $R_1$  is 2-ethylhexyl,  $R_2$  is ethyl,  $R_3$  is a methylene group,  $R_4$  is ethyl, and  $R_5$  is 2-ethylhexyl.

45. The composition of Claim 44, wherein the cation is tetrabutyl ammonium.

46. The composition of Claim 44, wherein the cation is 1-methyl-3-hexyl imidazolium.

47. The composition of Claim 43, wherein  $R_1$  is 2-ethylhexyl,  $R_2$  is a hydrogen atom,  $R_3$  is a methylene group,  $R_4$  is a hydrogen atom, and  $R_5$  is 2-ethylhexyl.

48. The composition of Claim 47, wherein the cation is tetrabutyl ammonium.

49. The composition of Claim 47, wherein the cation is 1-methyl-3-hexyl imidazolium.

50. The composition of claim 43, further comprising a hydrocarbon.

51. The composition of claim 1, wherein the cation and the anion form a molten salt having a melting point of less than about 100°C, the molten salt being selected from the group consisting of tetrabutylammonium docusate, MeBu<sub>3</sub>N docusate, Me<sub>3</sub>N(CH<sub>2</sub>)<sub>6</sub>NMe<sub>3</sub> docusate, Bu<sub>4</sub>P docusate, Et<sub>4</sub>N docusate, 1-hexyl-3-methyl imidazolium docusate, 1-octyl-3-methyl imidazolium bromide docusate, 1-butyl-3-methyl imidazolium docusate, and 1-methyl-2-ethyl imidazolium docusate.

52. A composition comprising:

(a) an ionic liquid containing an anion that is selected from the group consisting of (i) docusate,

(ii) an anion of a bis(organo)ester derivative of sulfosuccinic acid, and (iii) an anion of a bis(organoamide) derivative of sulfosuccinic acid; and

(b) CO<sub>2</sub> at supercritical conditions;

- 1 wherein the ionic liquid is dissolved in the CO<sub>2</sub>.
- 2 53. A composition comprising:
- 3 (a) a hydrocarbon fuel; and
- 4 (b) an ionic liquid containing an anion that is selected from the group consisting of (i) docusate,
- 5 (ii) an anion of a bis(organo)ester derivative of sulfosuccinic acid, and (iii) an anion of a
- 6 bis(organoamide) derivative of sulfosuccinic acid.
- 7 54. A composition comprising:
- 8 (a) a polymer; and
- 9 (b) an anti-static additive comprising an ionic liquid containing an anion that is selected from the
- 10 group consisting of (i) docusate, (ii) an anion of a bis(organo)ester derivative of sulfosuccinic
- 11 acid, and (iii) an anion of a bis(organoamide) derivative of sulfosuccinic acid.
- 12 55. The composition of claim 54, wherein the polymer is polyvinylacetate.
- 13 56. An ionic liquid composition, comprising:
- 14 (a) an onium cation having more than 4 carbon atoms; and
- 15 (b) an anion selected from the group consisting of Docusate and a docusate variant.
- 16 57. The ionic liquid composition of claim 56 wherein the ionic liquid melts at a temperature
- 17 range that is greater than about 40° C but less than about 80° C.
- 18 58. A composition, comprising:
- 19 a first ionic liquid combined with a second ionic liquid,
- 20 (a) the first ionic liquid comprising:
- 21 (i) a cation selected from the group consisting of ammonium, sulfonium, and
- 22 phosphonium cations, said cation being non-tetrahedrally symmetric;
- 23 (ii) an anion having the formula Al<sub>y</sub>R<sub>3y+1</sub> wherein y is greater than 0 and R is
- 24 independently selected from the group consisting of an alkyl group and halogen
- 25 group;
- 26 (b) the second ionic liquid comprising an anion that is selected from the group
- 27 consisting of (i) docusate, (ii) an anion of a bis(organo)ester derivative of
- 28 sulfosuccinic acid, and (iii) an anion of a bis(organoamide) derivative of
- 29 sulfosuccinic acid.
- 30 59. The composition of claim 58, further comprising reactants, the first and second ionic
- 31 liquids being an effective reaction solvent for the reactants.